

92 Time for Change



As you learned in Activity 90, “Figuring Out Fossils,” the history of Earth is divided into time spans. These time spans do not last any specific number of years. The beginnings and endings of the time spans are determined by fossils—either the appearance of new types of fossils that are not found in any older rocks or the disappearance of fossils that are commonly found in older rocks. With the help of radioactive dating technology, scientists have made good estimates of how many years each time span lasted.



How long have organisms been living on Earth?



Jurassic sea star fossils

MATERIALS



For the class

2 sets of 8 fossils



For each pair of students

1 set of 6 Time Cards

1 metric ruler

1 90-cm strip of paper



For each student

1 Student Sheet 92.1, “Personal Time Scale”

1 Student Sheet 92.2, “Major Divisions of Geologic Time”

PROCEDURE

Part A: Personal Time Scale, Geologic-Style

1. Look at the following list of events. Write the event that occurred most recently at the top of the column labeled “Order of Events” on Student Sheet 92.1, “Personal Time Scale.”

I started fourth grade.

I ate or drank something.

I learned to walk.

I woke up.

I was born.

I took a breath.

I started kindergarten.

I learned to read.

My parents were born.

2. Use the remaining spaces in the “Order of Events” column to write down the other events from most recent (at the top) to most distant (at the bottom).
3. In the column “Number of Years Ago,” write the number of years ago that each event occurred (you can round off to the nearest year, or half-year). Like a paleontologist, count time backward from the present day. For example, if the event occurred 10 years ago, write “10 ya” as the time of the event. (The unit “ya” means “years ago.”)
4. Think of a major event in your life that is important to you. (It may or may not already be described in your “Order of Events” column). Use this event to divide your time scale into two time periods by drawing a horizontal line to mark when the event occurred. For example, if you choose entering school as the major event, you could draw a line right below “I started kindergarten.”



These students were born about 14 ya.

5. Name the two time periods that you just created. For example, if you drew a line at the time you first started school, the time period before that could be called “Pre-Schoolian.”
6. As a class, compare the events that you and your classmates chose to divide your personal time scales into two periods. Work together to agree on a single event that was important to everyone in class. Agree on names for the time periods before and after that event.

Part B: Geologic Time

7. Imagine that a paleontologist asks you to help her put in order some periods of time in the history of life. With your partner, read carefully the information on the six Time Cards and arrange them with the oldest on the left and the most recent on the right.
8. In your science notebook, record the order in which you placed the cards.
9. View the work of other student groups. Observe the similarities and differences between their orderings and yours. Discuss your choices.
10. Obtain Student Sheet 92.2, “Major Divisions of Geologic Time,” and a 90-cm strip of paper from your teacher. Use the information on Student Sheet 92.2 to arrange the cards in the order scientists have determined from geologic evidence. In your science notebook, record any changes that you needed to make to your original order.
11. Follow Steps 11a–d to construct a timeline of the last 4,500 million years:
 - a. Using Student Sheet 92.2, work with your partner to calculate the distance (in cm) that each time span will cover on your timeline.

Hint: Since your timeline must represent 4,500 million years over 90 centimeters, first divide 4,500 by 90 to determine how much time each centimeter will represent.



Mount Rainier formed approximately one million ya (1 mya).

- b. Draw a vertical line near one end of your long strip of paper and label it "The Origin of Earth."
 - c. Using "The Origin of Earth" as a starting line, use a ruler and your calculations from Student Sheet 92.2 to mark the boundaries between the time spans.
 - d. Label each time span with its name and each boundary with its defining event.
12. The figure below presents photos of the fossils you examined and sketched in Activity 90, "Figuring Out Fossils." In the appropriate time period on your timeline, draw and label a quick sketch or outline of each one.

A FEW FAMILIAR FOSSILS



ANALYSIS



1. Think back to how you and your classmates divided your personal time scales into periods. How do you think scientists determined how to divide geologic time into its periods?



2. The total length of your timeline of Earth's history is 90 cm. Use your timeline to determine the fraction of Earth's history that:
 - a. single-celled organisms have lived on our planet.
 - b. multicellular organisms have lived on our planet.
3. **Reflection:** Imagine that no species ever became extinct. Do you think there would be more, less, or the same amount of diversity of life forms on our planet? Explain your answer.

EXTENSION 1

Obtain a copy of a more detailed geologic time scale. Construct a timeline that represents only the last 550 million years. Label all the *periods* with their names and be sure to distinguish them from the *eras*. What additional information were you able to include on this timeline? What are the advantages and disadvantages of creating timelines for shorter time periods?

EXTENSION 2

As a class, create a giant timeline that represents some of the major events (such as the first fossils of interesting life forms, mass extinctions, etc.) that have occurred during the 4.5 billion-year history of Earth. Stand at appropriately scaled distances from your classmates, and together hold up signs representing major events in the history of life.